the Atom

November 1979

the Atom

Vol. 16, Number 8
November 1979

Publisher

Published monthly except for July-August and January-February issues by the University of California, Los Alamos Scientific Laboratory, Office of Public Information. Address mail to MS 318, P.O. Box 1663, Los Alamos, New Mexico 87545. Second class postage paid at Los Alamos, N.M.
ISSN 0004-7023. USPS 712-940

Office

1325 Trinity Drive, Telephone (505) 667-6101. Address inter-office mail to PUB-1, MS 318.

ON THE COVER:

An aversion to claustrophobia can be beneficial when checking files in the banks of metal drawers at the records center. But beyond the daily routines lies a wealth of historical information, if you know where to look. More photos by LeRoy N. Sanchez and a story follow.

Previews

Year One and beyond

LASL's paper chase

By Jeff Pederson

People interested in Laboratory history have a unique dating system, usable only in vernacular references.

"Year One" always means 1943. From this date, modern history extends. The year marks the official founding of the Los Alamos Scientific Laboratory, its goals set forth in a then-secret letter mailed to wartime Director J. Robert Oppenheimer.

Not all LASL employees at the time have realized the historical importance of their crash program to build an atomic weapon in less than 3 years. Who from the 1943 badge picture files remembers Harold Agnew, Anita Martinez, Dick Baker, Arnold McCloat, Bill Ogle, Felipe Baca, Klaus Fuchs, Bonnie May Jourdan, Dorothy McKibben, Pablo G. Baca, Hans Bethe, James R. Luse, Edward Hammel, James Bridge, Nick Metropolis?

And who, nearly 37 years after Year One, can say today if he or she is playing a part in tomorrow's history? What staff researcher, whose official notebooks are methodically stored in steel drawers, will become involved in a patent discussion? Will the next poet laureate or freelance historian be fascinated by now-disbanded programs, such as Project Rover for nuclear propulsion?

Former Directors J. Robert Oppenheimer and Norris Bradbury, represented in this historical file, received handwritten entries in one of the first LASL telephone directories.

Photos by LeRoy N. Sanchez

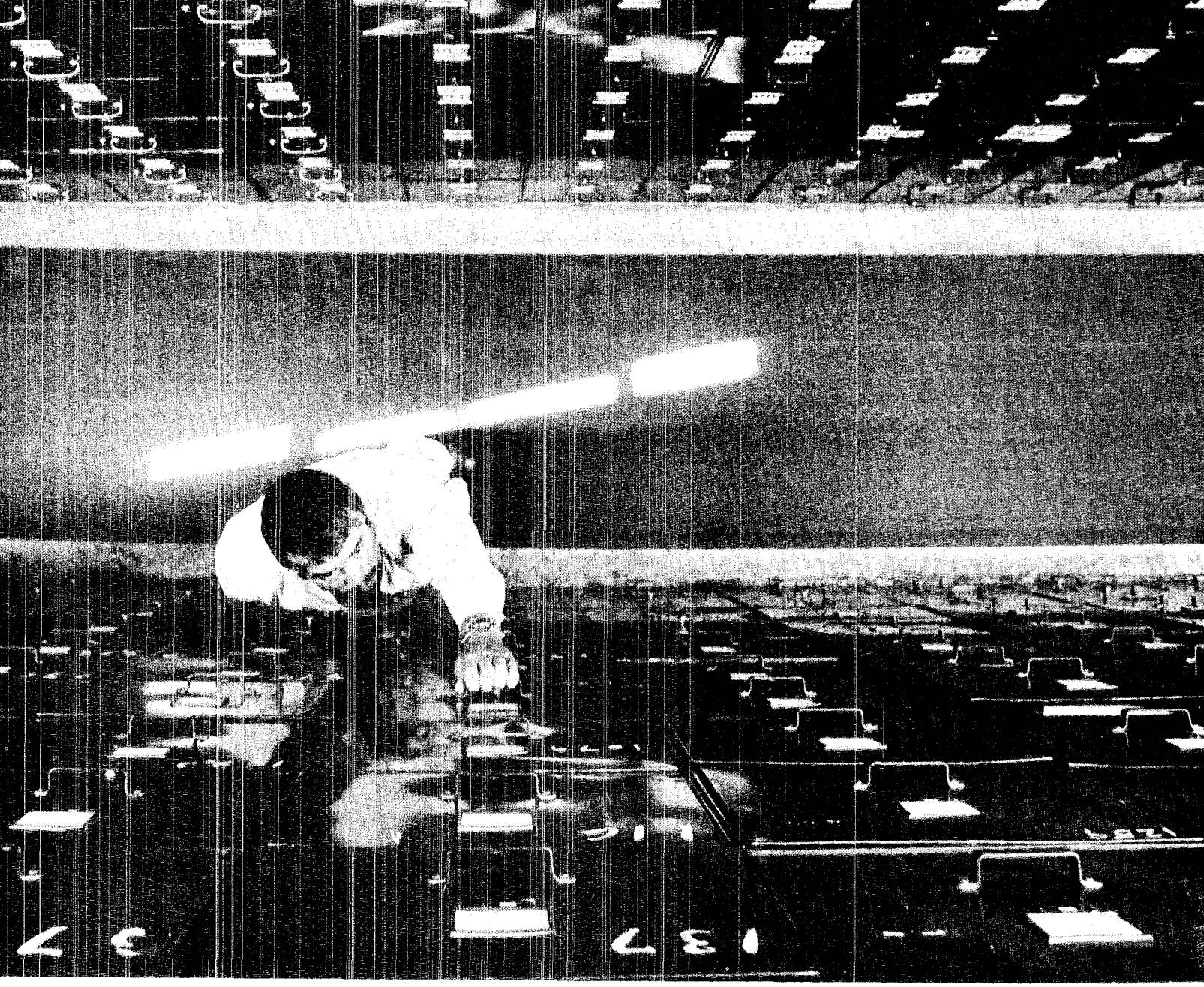
10,000 cubic feet

The answers may not come from us, but from our documents. There is plenty to choose from among the 10,000 cubic feet of papers, microfilm, notebooks, payroll data, and medical x-rays at the storehouse operated by the Records and Forms Management section of Group ISD-5, the people who also bring you the mail.

Behind the blue doors of the building, built in the late 1940s by the Atomic Energy Commission (AEC) in downtown Los Alamos, 8 persons work daily with these assorted records, which are retained either by government regulation or for historical significance. It was not always so.

When section leader Walt Bramlett arrived here in 1948 to work for the AEC, there was no storage center for records. His boss was able to obtain space in one bay of the building, which was constructed to warehouse AEC uniforms, guns, and ammunition. After a stint in Albuquerque, where the AEC area office moved, Bramlett came back to Los Alamos in 1956 to work for the Laboratory and has dealt with its records ever since.

By then, the ISD-5 vault was getting saturated. "We were finally able to convince the AEC that more space was needed," he recalled. Eventually the entire building was turned over to the Laboratory, and not to the county, as had been contemplated.



Today, one storage bay is "open" and used by the Zia Co., but the remainder of the building is a security area, because many classified documents are stored there. Motion detectors, window bars, and combination-lock doors all restrict entry. The detectors are sensitive enough to have caused a week of confusion when a bird, which errantly entered during business hours one day, set the alarms off each night before it was located as the transgressor.

Just how long records are held depends. Retention periods vary, and documents labeled "inactive," or not needed for daily use, may be sent to the center. Two analysts on the staff may suggest to document owners that the material be discarded if it's not likely to be needed again.

"We do not automatically destroy anything," emphasized Bramlett, explaining that ISD-5 sends a notice to the particular group on such occasions. If there is still a justification for keeping "inactive" materials longer, they will be retained.

Frozen files

To cite one curious instance all records relating to the procurement of automatic data processing equipment have been "frozen" due to

Reaching for a drawer, Pres Martinez is dwarfed by 10-foot-high rows of metal shelves. Records people have 13,026 Laboratory notebooks in their care.

"Year One" always means 1943. From this date, modern history extends.

Records relating to lawsuits can be "frozen" indefinitely. Then, there are the medical x-rays, going back to 1943 and including every employee.

pending action from a government-IBM Corp. suit. Another possible suit involves the state of New Mexico for sales tax exemptions for the years 1965-69, and purchase orders placed during this period are also frozen.

"Every time there's a lawsuit," said Bramlett, "there's a freeze on records."

The amount is growing. The records center tries to destroy as many unneeded documents as is possible, but Laboratory growth — to mention the Laser Research and Technology Division and the Medium Energy Physics Division as just 2 instances — has been awesome in the last decade.

Routinely, purchase orders routed through the Supply and Property (SP) Department are saved for 3 years if the value represented is less than $10,000. If the value is greater, the records must be kept for 6 years. Purchase order copies from the Accounting (AO) Department, as well as receiving reports and records of payment, are also retained as transactions are made.

Also from the accounting office come payroll files, mostly on magnetic tape. Administrative files come from virtually every Laboratory group, and cover everything from policies to daily routines.

Then there are the medical x-rays, going all the way back to Year One. The floor at the Occupational Health (H-2) building wasn't built to support the concentrated load, so the x-rays are all filed by name at the records center, whether they are current or not. At 25 requests per day for x-rays, this file is the most active in the building.

"We have proposed to put the x-rays on more compact film, and we've been told that's okay if there's nothing wrong medically with the individuals," said Bramlett. "But who's going to go through and decide?"

13,026 notebooks

Let's not forget the "LA Notebook" series. If you worked in the records center, it would be hard to — there are 13,026 notebooks stored in 1,103 large metal drawers. These books, issued from the Laboratory's founding through the present day to staff members, are used to record experimental results and to comment on data or ideas. Many contain classified information. Others may be of future value in patent cases. Some may interest future researchers wishing to delve into the history of a particular scientific program.

The notebooks may be micro-

The most active file is the x-ray records, which cover every employee from 1943 through the present day. About 25 x-rays are requested daily. Here, Joe Lopez pulls one.

filmed after 20 years, providing anything of historical importance is retained in the original paper form. Project Rover documents, for example, have been retained under government directive in case aspects of the program are ever reinstated.

Other items on file include aperature cards, which have a window to hold microfilm images, and stacks of regular computer punch cards. There are 100-foot rolls of 16mm microfilm in steel cabinets. They each contain more than 100 times the information than can be typed on the same amount of paper. It would be possible to convert much of the records center material to microfilm, but for historical significance, such as Manhattan Engineer District items slated for the National Archives, the original is preferred.

"We have to do a lot of microfilming just to stay ahead," said Bramlett, pointing to a bank of files that was photocopied, leaving space for other documents. "We're just about filled up."

Simple system

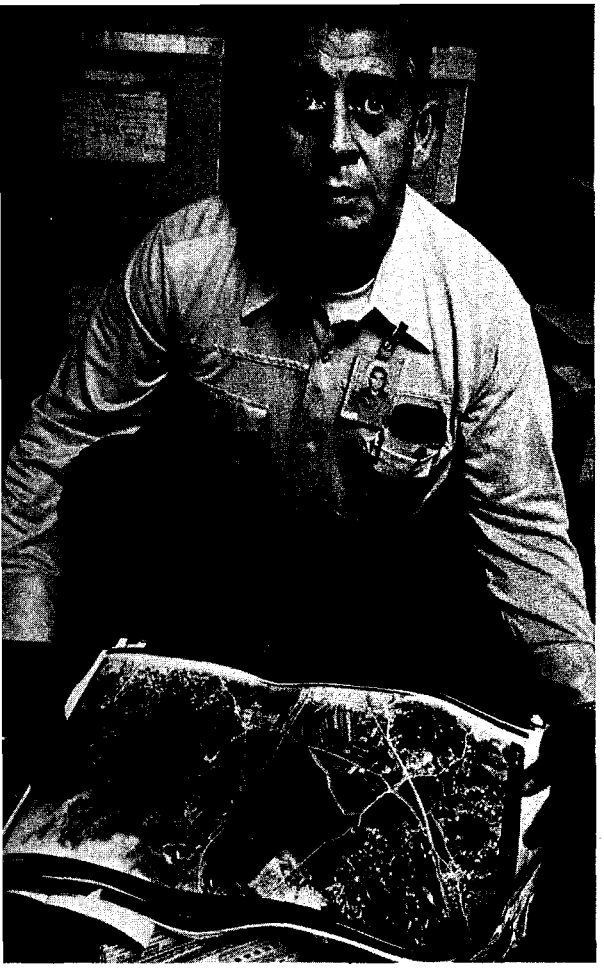
During a recent visit, an anomalous shipment of 6 cardboard boxes labeled "reference files" had been placed on the receiving space inside the records center door. They will be held for a year while the staff member is away from Los Alamos. Such requests are not routine, and cannot always be honored, because personal boxes are normally kept in an office, but these will temporarily be filed under the man's name.

They will be received, indexed, and handled like any other stack of documents headed for open metal shelves or the 10-foot high banks of file drawers.

A received file is noted on a records transfer request form and is assigned a number. The form gives the storage location, a description of the records, and retention periods. A parallel card file is also maintained, indexed by subject. The "Rover" heading, for instance, covers some 15 different entries of shipped-in materials.

Another group of white binders contains the dates when files were

Box upon box may be found in the open shelving corridors, holding part of the 10,000 cubic feet of materials stored by ISD-5. Albert Montoya and Johnny Roybal check the dating on some of them.



Old maps, such as the one of Hiroshima displayed by Art Rivera, are part of the thousands of cubic feet of documents at the records center. Some 30 boxes are slated for the National Archives.

One research request was for correspondence and manuscripts of 6,000 physicists active to 1952. A Princeton professor recently came away with 450 photocopied pages and 1,100 duplicated images.

destroyed. In some cases, the records center must later show why things were not stored indefinitely, instead of being buried or macerated. Each month, all records slated for "dumping" are pulled out and the owner is notified. Then the unclassified records are picked up and delivered to the landfill, where they are immediately earthed. Classified files are macerated. A paper shredder is occasionally used on request for sensitive — but not classfied — documents.

The center has a film reader/printer for microfilm, microfiche, 16mm and 35mm film. There is a simple computer program for identifying film.

"Everything here is manual," said Bramlett of the indexing system, "but it works." Thought has been given to an automated system.

Researching for requests

The indexing, coupled with the memories of employees, can help when a search is required. "There have been a few cases where someone only thinks a certain memo was written," Bramlett explained. "If we can't find any trace of it, there may have been only a telephone conversation."

Some files have been culled, such as those pertaining to the Manhattan Engineer District from Year One onward. Others are intermingled in the storage shelves and cabinets. None have been inspected by an official archivist, because there isn't one on the staff.

Some 30 boxes of material, including letters, memos, and drawings, have been selected for inclusion into the National Archives. Pending a final classification review, now in progress, they will become part of the nation's history trove in Washington.

Outsiders may come to the center from time to time for research. If they do not have a security clearance, they must be escorted by records center personnel while inside.

Dick Hewlitt, for instance, is a DOE historian now working on his third book and has visited the records center more than once. Another DOE contract historian is reviewing the history of the controlled thermonuclear research

The file system is not automated, but it works. Johnny Roybal checks an entry for Project Rover, now disbanded.

program from its beginnings through 1968, and has obtained more than 300 photocopies of documents and about 1,500 microimages so far.

Was person X ever a Laboratory employee? the records people were asked. Bramlett said the correspondence files were searched in vain, but Person X's name was found in 6 different LASL telephone directories. He apparently was located at Sandia many years ago, one of those persons whose files became a bit scrambled with time.

Requests can be of the head-scratching variety as well. One, from the Office for History of Science and Technology at a major California university campus, asked for copies of the correspondence and unpublished manuscripts of the 6,000 physicists active to 1952. The person also requested information on 7 specific scientists who were in Los Alamos, "plus others." Temporarily, this request has been postponed, because there isn't enough manpower to supply the author, recipient, date, and length of all the pertinent pages.

A Princeton professor recently came away with 450 photocopied pages of material, along with 1,100 duplicated images.

The records center can also become involved with research for lawsuits. The earlier days of atmospheric atomic testing, in particular, have spawned a new wave of suits as persons petition the government for alleged injuries due to radiation exposures. In one case, the records showed that a former employee who died about 3 years ago almost certainly had no exposures while he worked at LASL. That detective work resulted in an appreciative letter from the DOE's Office of Chief Counsel.

Skeletons

Other files are enough to rattle the skeletons in the closet. The Rosenberg case. Martin Sobell. Klaus Fuchs. David Greenglass. Plus the Oppenheimer security hearings. All are represented here, from letter to government file to news clipping.

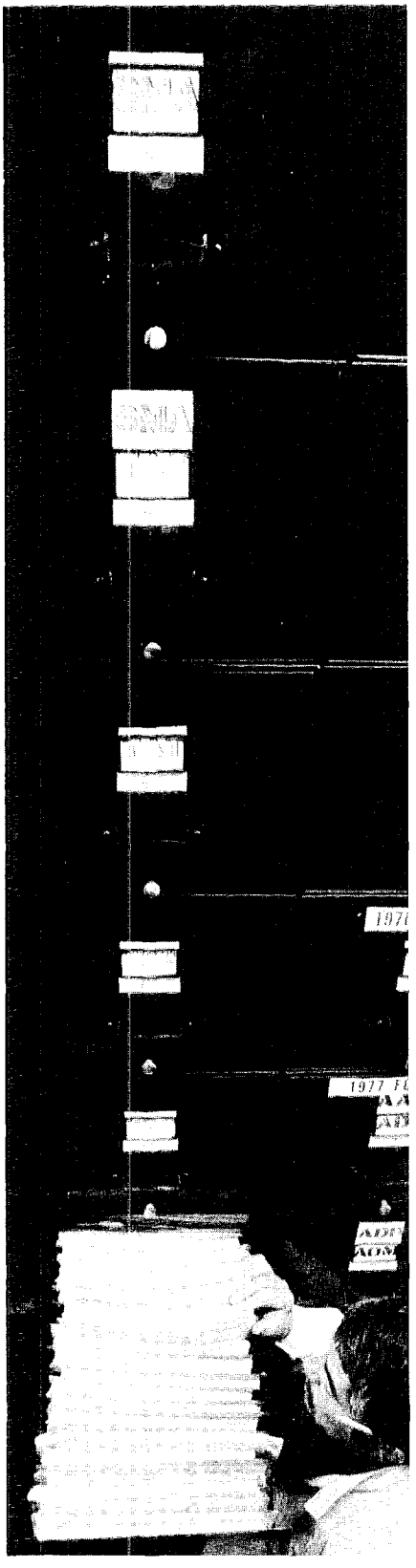
But it is perhaps the Year One documents that raise the most dust. "Sometimes the oldtimers will start looking at the first photo book of employees," said Bramlett, "and they won't stop until they go through the whole album. Like many of them say, if they're going to write a history about LASL, they better get on it, while there are still people around with a lot of information in their heads."

In the first known LASL telephone book, the names "Oppie" and "Norris Bradbury" are handwritten between the mimeographed entries of others. One is in ink, the other in pencil. Humble notations for the first 2 Laboratory Directors.

History.

"Sometimes the oldtimers will start looking at the first photo book of employees, and they won't stop until they go through the whole album."

For archival purposes, paper is preferred.



Space Shuttle perspective: "It's really a truck."

"In the sixties, we went to the moon and turned around and nobody was looking," said Joseph P. Kerwin, 47, Skylab astronaut. "But if we ever decide planetary missions are desirable, we will have the crews to do the job."

Kerwin was a Los Alamos visitor recently. He is a physician and Navy captain who currently supervises astronaut planning for all Space Shuttle missions beyond the orbital flight tests, the first of which is planned for summer, 1980. That's years from the Mercury-era appellation tossed at astronauts, who were called "guinea pigs" by fellow test pilots. There is a parallel difference between the engineering flavor of early space flights, and the human-oriented present-day Space Shuttle concepts, he continued.

The Space Shuttle itself, explained Kerwin, who was 1 of 3 Skylab-2 participants in 1973, will have a 100-mission lifetime. It can carry a 60,000-pound payload in its bay, 15 feet in diameter by 60 feet long. The shuttle is launched with 2 reusable solid rocket boosters and 1 large liquid propellant fuel tank that is jettisoned. Its earth orbit will typically be 250 to 300 miles high, though the craft can reach 600 miles; the payload capacity drops accordingly.

"It's really a truck," said Kerwin of Shuttle. "It's a DC-3." Its main purpose as a workhorse is to bring experimental equipment and cargo to space. It's not a long duration space laboratory or living area. However, it could be used to put a space station together "like a Tinker Toy."

Coming back to earth from space orbit, Shuttle lands on a very long runway (12,000 feet) like a plane, only with its limited maneuverabilityy and short wings, said Kerwin, "It glides like a dropped set of car keys."

NASA hopes for 2-week turnaround times between Shuttle flights, and is expecting a fleet of 4 craft by the mid-1980s. That schedule, however, called for a first flight in March of 1979, a deadline long past, so some payloads are "stacked up" waiting for flights.

The first 35 flights will have deployable payloads, including communications satellites, science satellites, and military satellites. In a Spacelab series, with a structure designed and built by the European Space Agency, 3 finalists from Holland, Germany and Switzerland are vying for the opportunity to fly as the first Western Europeans in space. In addition, "Getaway Specials" will offer inexpensive flights for payloads starting at 2 cubic feet, since there are spare nooks in the Shuttle bay. These specials cost $3,000 and up.

Shuttle must remain a ferry service, said Kerwin, and not become a space station for long term operations. No station has been approved by NASA, he added, although the Russians "are to that point."

As far as the Shuttle crews themselves are concerned, said Kerwin, an average might be 3 persons, although up to 7 can be carried. The first is the commander-pilot, who has overall authority for the flight. The mission specialist is in charge of running the facility, its orbiter, communications, and electronics systems. The payload specialist, who need not be a professional astronaut, represents the principal scientific investigator.

The latter could be trained to fly in orbit within 6 months, said Kerwin, since they don't require the complicated training of the commander or the mission specialist. "It will be interesting to see how this concept works out," he added, noting that it is the man in the center, the mission specialist, who really has 2 bosses. Crew teams are now training in a cooperative atmosphere.

Years later, if extra space permits, passengers may be able to ride the Shuttle, perhaps at the goal of $1 per pound, perhaps at $100 per pound.

"The food isn't that great, but the view is fantastic," said Kerwin.

— JLP

Photo by LeRoy N. Sanchez

A brief interview

How does your background in medicine affect your outlook toward space use and exploration?

I'm interested in the problems of attending human operators. What effects, for instance, will long flights, large crews, and remote locations have? How should we qualify crews for flight, how should we plan for their care and feeding? There may be no hospital facilities available for 2½ years in some cases. For the near term of our space project we are looking at crews of up to 12. In the long term, perhaps 25 years from now, we are looking at crews of up to 100 persons.

What is your main day-to-day challenge in your Houston job?

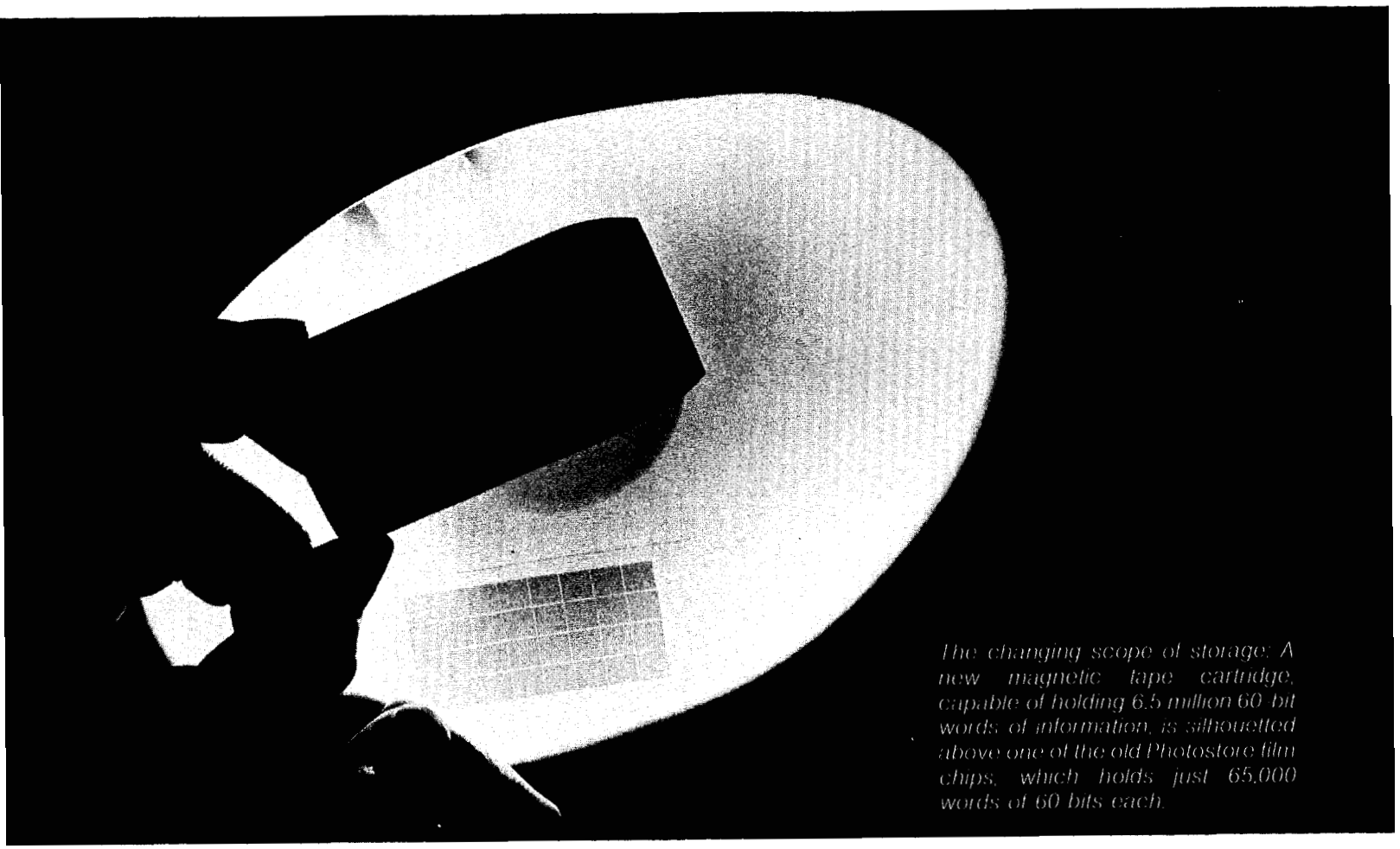
The hardware and mission procedures for near-term payloads. That includes about 30 Space Shuttle flights.

How would you characterize America's interest in space now, compared against 1969 (the moon) or 1973 (Skylab II)?

It is widespread, but not very deep. It is on the gee-whiz basis of a fun toy. Astronauts are thought of like football players. In the 1960s, there was a fear of the U.S.S.R. that spurred us on. Now the emphasis is not negative, not a substitute for war. The deeper you go in government, particularly in regards to security, the better the understanding of space programs. Especially in Congress, support has always been good.

What is NASA's role in present and future space programs?

Since 1970, it has been earth-oriented. It has centered on things like weather forecasting, crop predictions, communications. The Space Shuttle launches satellites for all of these things. Actual space exploration is farther away. I don't know when we will get there. In a 3-month flight, there can be profound changes on man. What would be the effects on animal colonies, born in space? It would be fairly easy to run animal generations up there first, experiments that would be, I guess, kind of a Noah's Ark.



The changing scope of storage: A new magnetic tape cartridge, capable of holding 6.5 million 60 bit words of information, is silhouetted above one of the old Photostore film chips, which holds just 65,000 words of 60 bits each.

Short on storage? Try a few trillion bits

Not only is the amount of stored data huge, but it must be accessible. The Common File System replaces Hydra, and provides trillions of bits of information.

By Charlie Mitchell

LASL may have the world's best "number crunching" facility in the Central Computing Facility (CCF). But in these days of such super computers as the CRAY-1 (of which LASL will soon have 2), one must have somewhere to store all of the billions of numbers that are required to define and solve today's problems on such very large machines.

LASL now has that storage system. It is called the Common File System (CFS). It involved Norman Morse (C-4 group leader); Bill Collins (CFS section leader); Ron Christman, and Mike Blood (CFS designers); and a "team" composed of about 12 workers from the Computer Science and Services (C) Division.

Before one can hope to understand the magnitude of the CFS, one must know a little about the computing facility here and computers in general. In these days of small, handheld calculators and "home computer systems," everyone feels somewhat familiar with computers. Of course, we're all aware that a computer system is composed of some method of input, some "thing" that does the computation, and some method of displaying the answer.

The CCF is, very basically, the same. It can be accessed (for input) in a number of ways, the most familiar of which is through the computer terminal. The "worker" machines, such as the CDC 7600 computers and the CRAY-1, do the computations. The most common form of output is the computer printout — those reams of paper that are seen all over the Laboratory.

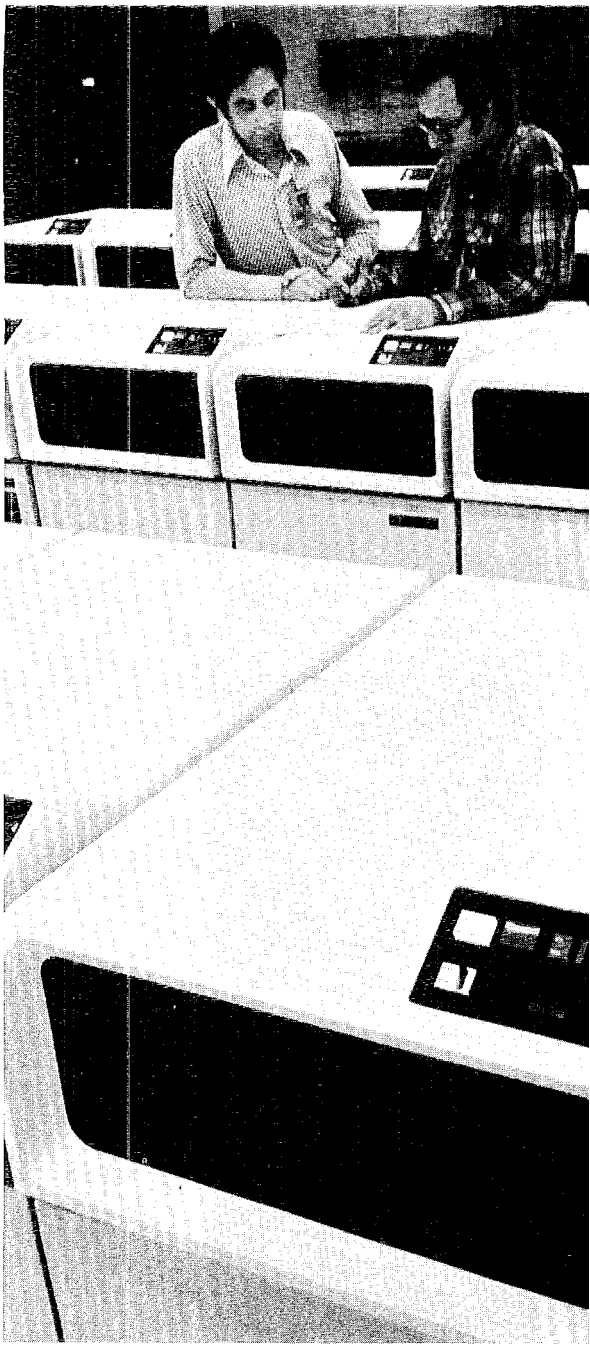
But our computer system is enormous and complex. The problems done in the CCF require millions and millions of bits of information to state and solve. Where is this information stored?

Chips versus Hydra

In the typical, flexible hand calculator, the information is stored on a tiny electronic chip called its memory. The computers in the CCF have very large memories, but not large enough to hold all of the different kinds of data needed on a day-to-day (or, in some cases, second-to-second) basis.

Not only is the amount of data that has to be stored huge, but it must be accessible by many users for use on a number of machines. Also, the data used routinely in the CCF may be unclassified, official use only, or classified. Each of these types of data must be accessed and handled differently.

To store this kind and amount of data, the computer system must be



Art Mascarenas and Joe Lopez, both of C-4, are shown with a part of the "disk farm" of the Common File System. These disk packs will generally be used for highly active computer files.

Photos by LeRoy N. Sanchez

A mechanical "hand" moves to the proper location in the honeycomb, plucks out the proper cartridge, and transfers it to a device where it is automatically loaded. It takes about 10 seconds.

served by a mass storage system. In the past, this system was called "Hydra."

With Hydra, which was designed about a decade ago, the main data storage entity was the IBM Photostore and supporting magnetic disk packs. With Photostore, data were written on small, photosensitive films by an electron beam.

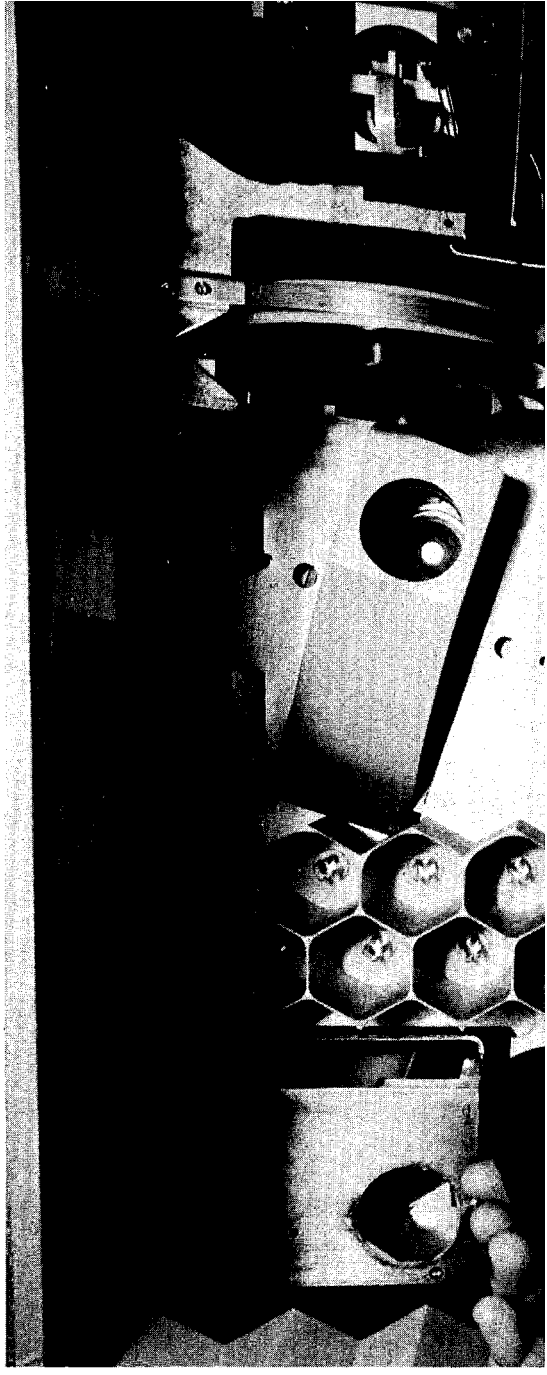
While the Photostore could store about a trillion bits of information, there were weaknesses. Only a few of the devices had been made, parts were getting scarce, and as a result, IBM announced the termination of the maintenance and support. In addition, the films produced on the Photostore system could not be erased and rewritten.

Because of these factors, and the availability of new and superior technologies, C-Division started conceptualizing and designing the new CFS for information storage. Planning on this new system was started formally in August of 1974. After some funding difficulties, the request for quotations on the equipment was issued in June 1976. The IBM 3850 mass storage system was accepted by the Laboratory in September of 1978. After a "friendly user period," the CFS was put into production in June 1979. This was a relatively short period between concept and production.

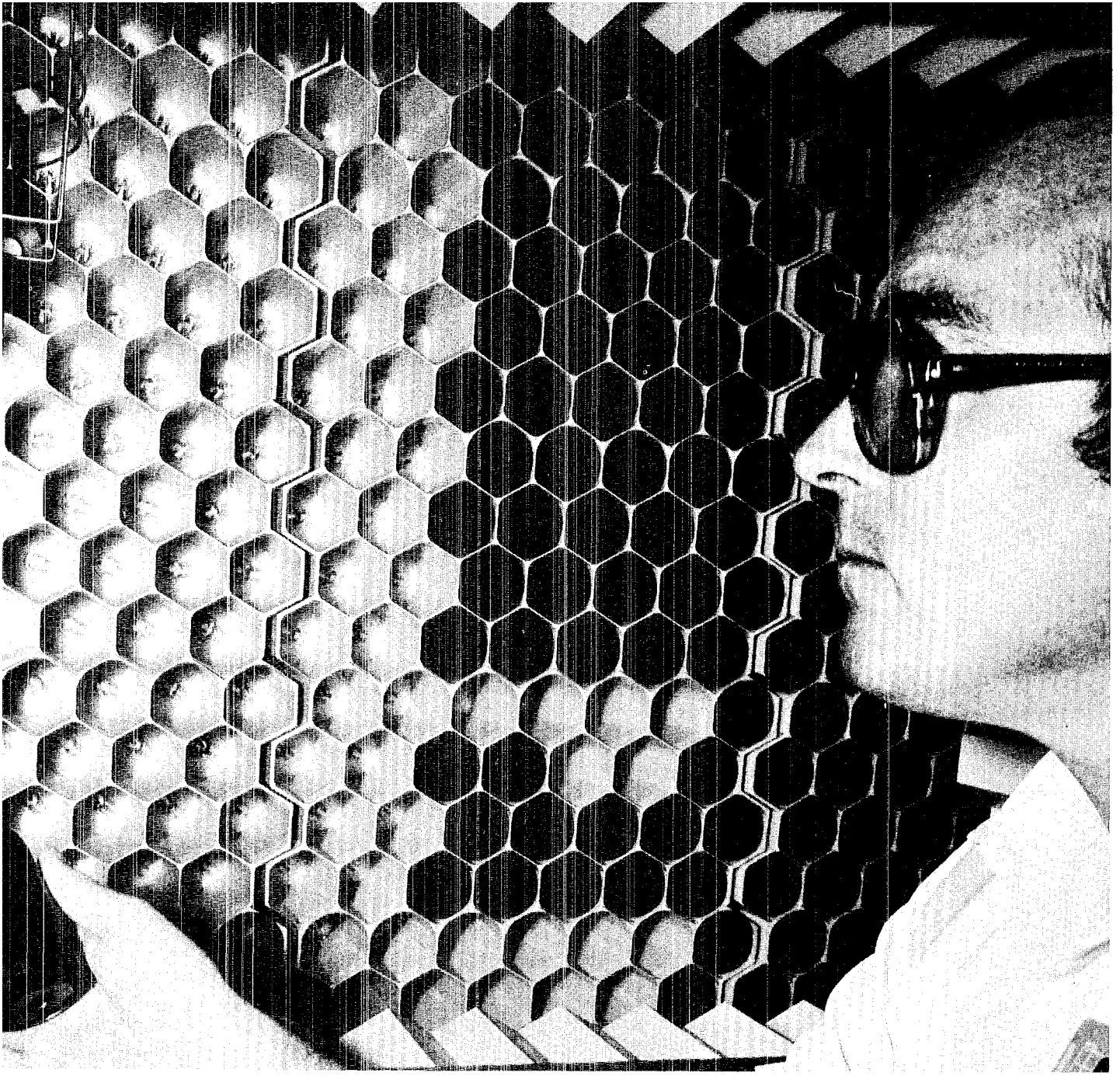
Honeycomb

What, then, is the CFS? It is a centralized mass storage system used to serve the LASL Integrated Computer Network. It provides 1.5 trillion bits of on-line storage for permanent and temporary files. That means that the information is immediately accessible to computer users.

The system also provides for storage of several trillion more bits of storage "off-line." This kind of



The heart of the Common File System. On left, with operator Marv Harlow of C-4 is the IBM-370/148 control processor. In the background, an IBM-3850 mass storage system is being loaded by Chris Trujillo, C-4. At right are Emily Wilbanks, Bill Collins, Ron Christman, and Mike Blood (seated), all of C-4.



Rick Pettit, C-4, holds one of the magnetic tape cartridges in front of the IBM-3850 honeycomb mass storage unit. The device that locates and transfers the proper cartridge to the read/write unit is at top left.

storage is archival. Using the CFS allows file sharing between users on the same or different machines in the computer network. Because of the rather unique "honeycomb" storage network in which the magnetic tape cartridges are kept, problems associated with manual magnetic tape handling and management are avoided.

The design of the new CFS stressed greater availability. That is, there should be less down time for maintenance. The designers wanted very low hardware read-error rates, on the order of 1 error for 5 billion words read. One of the design features of the CFS that was achieved was the ability to service more than 1,500 file requests while transferring 100 million words per hour. This latter feature is 3 times the Hydra capability.

The CFS stores files (blocks of data) in a 3-level hierarchy. This means that the user data may be stored on disk (for very active files), on on-line cartridges (for less active files), and off-line cartridges (for archival storage). Compared to Hydra, the CFS can store twice as much data — 1.5 rather than 0.8 trillion bits — on line.

Files are in a 3-level hierarchy, for very active files, less active files, and for archival storage.

Mechanical "hand"

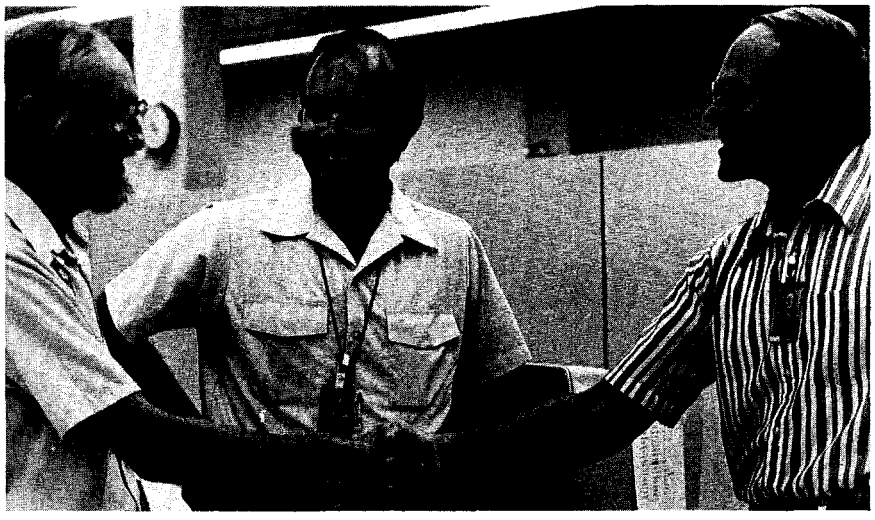
The CFS hardware system is impressive. There is row after row of magnetic disk drives which are used for high activity files. Opening the doors of the IBM 3850 mass storage cabinets reveals an arrangement of honeycomb cells into which the magnetic cartridges, containing the files, are loaded. Each cartridge is located in an XYZ coordinate system for retrieval. When a data file is called up, a mechanical "hand" moves to the proper location in the cell array, plucks out the proper cartridge, and transfers it to a read/write device where it is automatically loaded. It takes only 5 seconds to locate and deliver a cartridge to the read/write station, and another 5 seconds to verify the loaded cartridge is the correct one. With "typical" magnetic tape reels, the same process takes about 10 minutes. When not actually in the cells, cartridges are stored in pairs in small plastic containers.

The cartridges themselves each contain 707 inches of tape 2.75 inches wide. A cartridge can store 6.5 million, 60-bit words. As a comparison, 2 cartridges can store about the same amount of information as an IBM disk pack.

The similarity to magnetic disks does not end here. The magnetic tape cartridges can be thought of as "linear disks." In fact, a major advantage of the cartridge system is that they can be randomly written on and erased, as opposed to the permanence of the Photostore system.

Now that the CFS is fully operational, the Photostore and Hydra disk capability will be phased out by the end of 1979.

The CFS will not be a static system. The designers planned for expansion of both capacity and capabilities. In the future, there will be a backup control processor — the device which controls all of the functions of the CFS. It is planned that additional user functions will be added, and additional mass storage capacity is possible.



Congratulations were received by Bill Collins (CFS section leader) and Norm Morse (C-4 group leader) from Kaye Lathrop (Associate Director for Engineering Services) after the Common File System became operational ahead of schedule.

Short Subjects

Reorganization changes were outlined recently by director Donald M. Kerr. A new division for the Life Sciences (LS) was formed, with Donald F. Peterson as the acting leader. Part of the former Health Research (H) Division was transferred to the new LS Division, which now consists of the groups Toxicology, Biophysics, Genetics, Pathology, Organic Chemistry, and Environmental Science. The new H-Division consists of the groups Health Physics, Occupational Medicine, Safety, Industrial Hygiene, Waste Management, and Environmental Surveillance. George L. Voelz remains as leader of H-Division.

Director Kerr also announced the formation of a new Theoretical Application Division, which includes the former Theoretical Design (TD) Division, except for TD-7, plus single groups from 3 other divisions. Raymond Pollock is acting division leader while a search is begun for a permanent leader.

* * *

The report of the investigative committee on a tritium exposure from a uranium pot rupture that occurred May 4 has been released. The incident, at the Cryogenics Building, happened as a stainless steel pot containing uranium tritide was being heated to 200 degrees C. as the first step in an experiment. A false signal resulted in overheating, causing the uranium to react with iron in the stainless steel, weakening the pot. Tritium was oxidized and escaped into the lab because of an inadequate air flow. A staff member received about 13 Rem whole body exposure. The maximum quantity of tritium released was 0.32 grams. No decontamination was necessary.

* * *

Peter A. Carruthers, head of the Theoretical (T) Division, has been elected chairman of the board of trustees of the Aspen Center for Physics in Colorado, succeeding Murray Gell-Mann of Cal Tech. The Aspen Center is a nonprofit institute for physics research, sponsored by grants from industry, government agencies, national laboratories, and individuals. LASL is a laboratory associate of the center. More than 270 physicists participated in activities this summer.

* * *

In special August ceremonies, the Department of Energy awarded the prestigious Enrico Fermi Award for 1978 to 2 individuals. One is Harold M. Agnew, former LASL Director and now president of General Atomic Company in San Diego. The other is Wolfgang K.H. Panofsky, an expert in the field of particle physics. The award is presented in recognition of exceptional achievement in the atomic energy arena. It consists of a citation, gold medal, and $25,000; it is given with the approval of the president of the United States. Agnew is being cited for his innovative contributions to nuclear physics and weaponry, for his LASL leadership, and for his counsel to the government in national security. Panofsky is being cited for his contributions to particle physics studies, for his role in advancing accelerator technology, and for his advice to the government. The award dates to 1954 when the Atomic Energy Commission presented a special citation to Enrico Fermi, leader of the group which sustained the first controlled nuclear reaction in man's history in Chicago under Stagg Field in 1942.

* * *

Purchase orders for LASL totalled nearly $13 million for July, with $3 million in orders placed within New Mexico. State businesses should contact the Supply and Property Department for additional information.

* * *

About 150 scientists from major laboratories throughout the world attended a workshop here recently on programs of the Los Alamos Clinton P. Anderson Meson Physics Facility (LAMPF). This accelerator is the most powerful of its kind and is approaching full design capacity. Members were invited here to recommend the programs they feel most appropriate for LAMPF and other medium-energy physics facilities; persons came from Switzerland, France, Germany, the Netherlands, Canada, Japan, and the U.S.S.R. Beams of pi and mu mesons are produced at 10,000 more times intensity now at LAMPF than those available when construction commenced in 1968. A proton storage ring, scheduled for completion in the early 1980s, will enhance the pulsed neutron capability of LAMPF.

* * *

The Laboratory assisted the U.S. Public Health Service in August in the examination of a few Indian children from the Gallup, New Mexico area. They were given routine examinations at the request of the health agency to determine whether they had been exposed to radioactive materials after playing in puddles remaining from the break of a mill tailings pond dam. The examinations included urinalysis and whole-body counting.

* * *

At the State Fair

You might get worn around the edges if you entertained 50 guests at home. But you are bound to be fully frazzled if a good slice of 1,000,000 people walked through your living room.

That round figure was the attendance at the 1979 New Mexico State Fair, and there is no counting how many of those people visited the LASL booth in the Ag Exhibit Building. Let's leave it at "many."

What they saw was an eye-catching display that featured biomedical research, conducted by LASL and the New Mexico Cancer Research Institute. There was also in-

formation on cancer eye in cattle, cell cytometry, and a 15-minute color film clip that LASL boothers had all but memorized at the conclusions of their 2-day shifts in Albuquerque.

What they said was at times curiously revealing, although many people simply walked by, read some of the captions, or took a rest break to see the movie.

Several small children asked of the cytometry display, "How do you play it?" The display has moving colors.

A young woman, seeing the body cast used to station biomedical patients for pion treatments, said, "It's bizarre."

Two boys, walking by, had this exchange: "What is it?" said one. "I don't know, some kind of x-ray," replied his sidekick.

An older woman, viewing the cancer eye materials: "Oh, God."

A distracted man, stopping to read; "What the hell is this?"

And another man, whose father had experienced good success with the biomedical treatments, kept bringing acquaintances back repeatedly to see the display.

The LASL troops answered questions as they arose, having been forearmed with background presentations by staff members before fair time. They also had their share of experience with sweeping the carpet each 15 minutes and dusting parts of the display. The dust raised by thousands of persons is considerable, and static electricity builds up as well, attracting particulates to plastic windows and accelerator components.

LASL's display was near energy exhibits done by the state and by Public Service Co. If 1979 was an indication, the 1980 fair should prove successful for informing the public about some of the Laboratory's technical programs. The 1,000,000 cowboy-hatted bluejeans will be back, after all.

The state fair exhibit was coordinated by the Public Affairs Department, cooperating with LASL technical divisions. It was staffed by PUB-members from various groups.

Fraser E. Goff of G-6, one of many Geosciences Division staff members at Reno, presented a poster demonstration. He included a preliminary evaluation of the Aquarius Mountains region near Kingman, Arizona.

On the road with hot dry rock

By Vic Hogsett

From around the world, more than 1,000 people converged on Reno, Nevada, recently for a 5-day conference geared to expanding the geothermal frontier. This was the second time in as many weeks that LASL's Geosciences (G) Division entered its Hot Dry Rock (HDR) technology, the newest method of converting earth's heat to man's uses, into the public arena.

During mid-September, LASL hosted geothermal specialists at the second annual HDR Industrial Information Conference in Santa Fe. The manager of the national HDR Geothermal Energy Development Program, Gregory Nunz, stated, "HDR, as an energy source, has moved out of the 'research' stage and is now in an 'engineering development' stage." The Laboratory's attendance at Reno, and the annual Santa Fe meeting, are in keeping with the Department of Energy's policy of transferring new technology to public use.

Rapidly advancing

Coordinating the 2 meetings was John Rowley, G-Division, who said that the HDR program is one of the most rapidly advancing in geothermal energy research today. He explained how HDR differs from the standard approach of tapping earth's heat from naturally occurring hot water and steam.

The HDR concept involves pumping water through a deep hole drilled into low permeability rock. There, a manmade reservoir has been created by fracturing, and the fresh water is heated to temperatures in the neighborhood of 200 degrees Celsius. A second hole brings the water, under enough pressure to keep it liquid, back to the surface where heat can be drawn off to create electricity, heat buildings, or be used in industrial processes. The cooled water is then re-injected in this closed cycle to be heated again.

Recent tests at the first HDR research site at Fenton Hill lasted as long as 75 days and demonstrated the feasibility of HDR technology by

Plains Electric intends to construct a 3-10 megawatt pilot plant at Fenton Hill if the program demonstrates a commercial reservoir exists.

producing 4 to 5 megawatts of heat energy, according to Edward Kaufman of G-Division. As the next step in proving the concept, a deeper, hotter reservoir is being created at Fenton Hill. It will approximate a small commercial output (20 to 50 megawatts) and lifetime (10 years or more). On April 4, LASL began drilling a 13,500-foot hole from which the new reservoir will be produced.

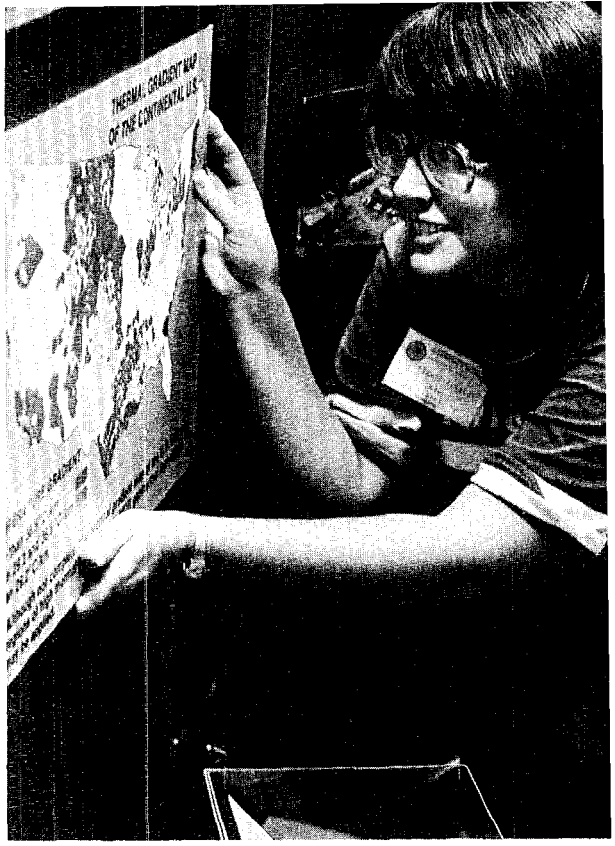
Almost 300 people, including more than 20 from abroad, attended the Santa Fe conference, where they received a broad overview of the LASL project. Information that might help industrial firms pursue HDR was strongly emphasized.

The conference included 6 technical sessions at Santa Fe's Hilton Inn. Participants were later treated to a tour of the Laboratory Geothermal site at Fenton Hill in the Jemez Mountains.

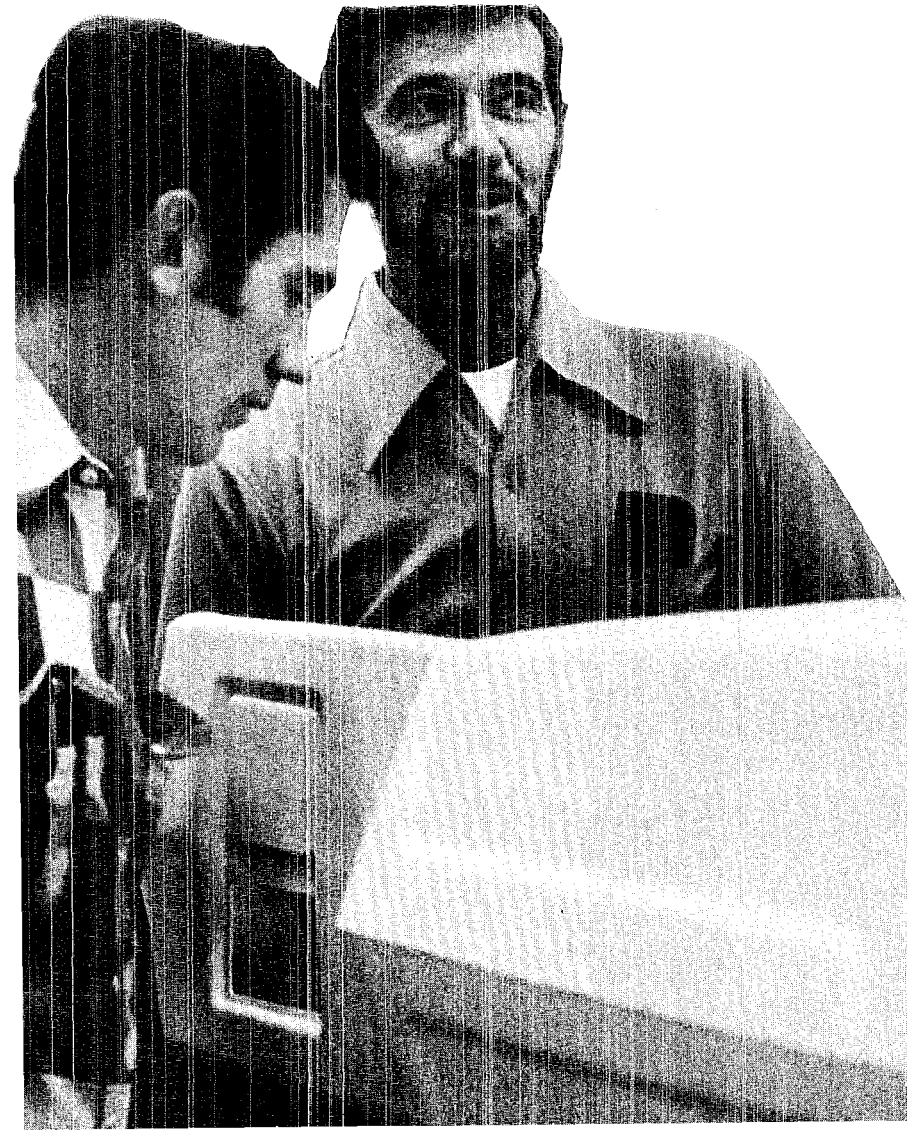
Gov. Bruce King kicked off the conference, and the opening session focused on the Department of Energy's HDR effort. Speakers included Nunz and Bennie DiBona, director of the DOE's Division of Geothermal Energy.

Production by 1990?

DiBona presented DOE's projection of HDR commercialization through A.D. 2020, showing production of power by 1990. He also announced that Plains Electric Generation Cooperative will participate in the Fenton Hill Project, intending to construct a 3 to 10 megawatt pilot plant there if the HDR program successfully demonstrates a reservoir of commercial use.

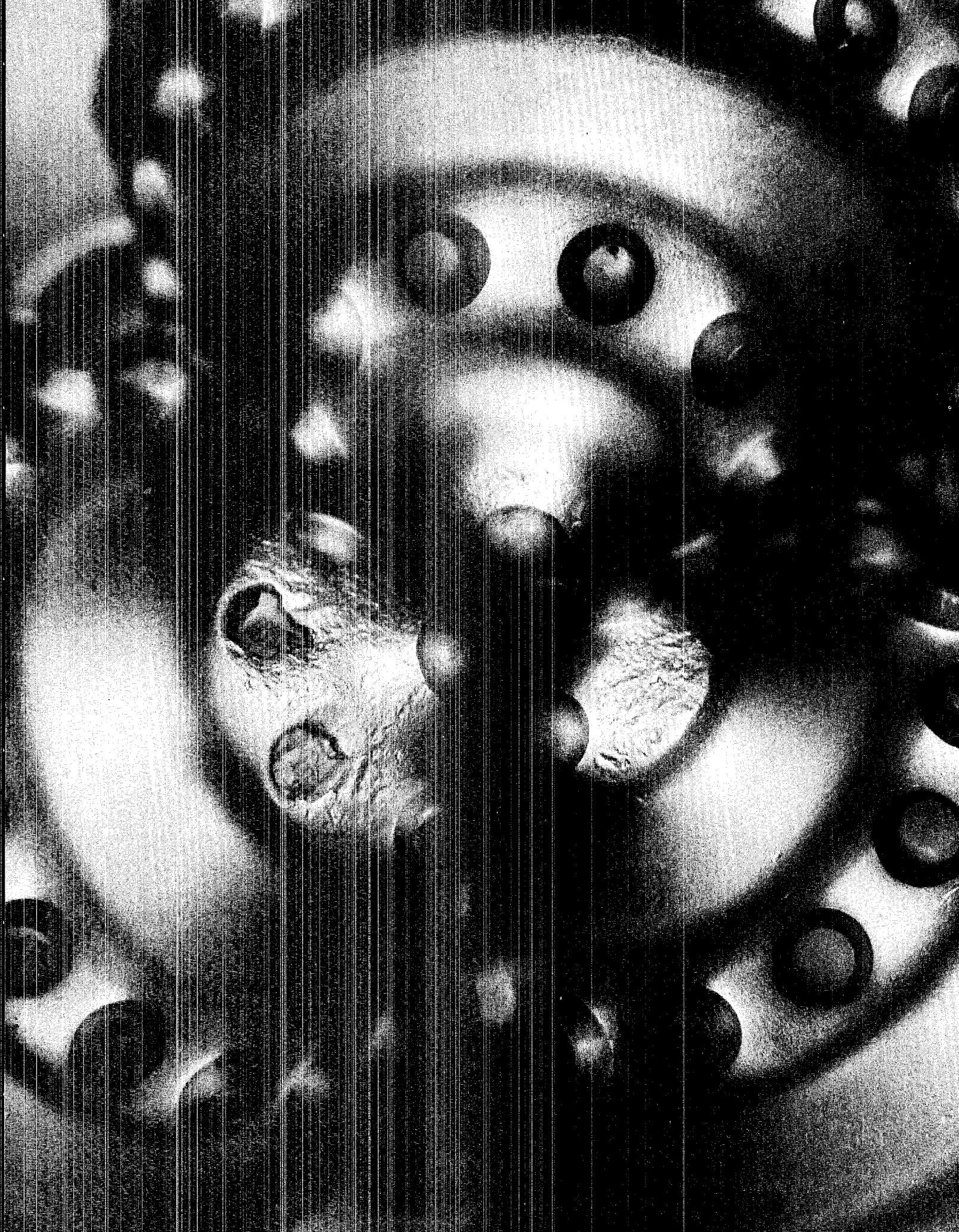


Steff Coonley, PUB-2, was among the Public Affairs Department members who staffed booths and coordinated media contacts in Santa Fe and Reno as the Hot Dry Rock Program took to the road.



Joe Skalski and Everett Horton, both G-4, used their technical backgrounds to advantage when touting the attributes of geothermal energy. They also repaired one of the booth displays.

Photos by Vic Hogsett



In the next 2 sessions, LASL scientists talked of HDR technical aspects. In the fourth session, industry and utility representatives discussed commercial economics, planning needs, and performance.

The final 2 sessions were devoted to presenting scientific findings and updating European HDR activities. The West German government, it was announced, plans to participate in the Fenton Hill project by funding 25 per cent — up to $2.5 million annually — of its operation. The West Germans were formally committed to the project in a subsequent Paris signing ceremony.

Road to Reno

The following week, the HDR people were on the road to Reno to attend the Geothermal Resources Council (GRC) annual meeting. The GRC is an 8-year-old trade association with more than 1,100 members. According to Rowley, "It has a representative membership of the entire geothermal industry," including legal representatives, developers, bankers, and geologists.

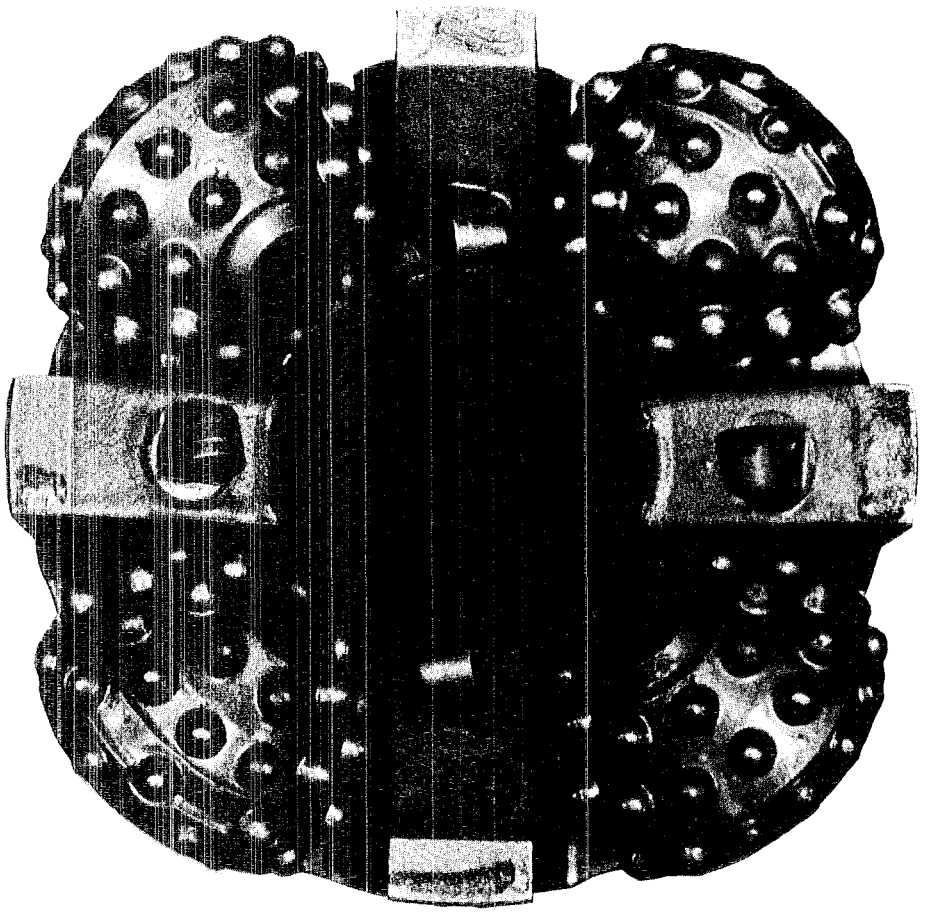
Turbodrill development was explained in a technical paper presented by Rowley; Joseph Neudecker of LASL's Design Engineering (WX) Division; William C. Mauer and William J. McDonald, both of Mauer Engineering; and Clifton Carwile of DOE's Division of Geothermal Energy.

Mauer told conferees that during field tests, 2 turbodrills were used to bore an energy extraction hole in a preselected direction. Each was 7.75 inches in diameter. The turbodrill, explained Mauer, was developed for easier and more accurate directional drilling, and for use in the heat found deep in the earth.

"Conventional drill bits deteriorated rapidly in the heat of this environment," Mauer said. "The turbodrill was a great success." The turbodrills were turned over to the drill rig crew for routine use, he added.

This bit, left, was used at Fenton Hill and is now on display.

The West Germans will participate in Fenton Hill by providing as much as $2.5 million annually.



LASL's success with hot dry rock is due in part to directional drilling, from the surface down farther than 10,000 feet. Drilling in the particularly hard strata around Los Alamos quickly wore down conventional diamond coring bits. This special synthetic diamond bit was developed by a private company especially for LASL, and it proved successful.

Aside from providing an information booth designed and staffed by the Public Relations Group (PUB-2), LASL also presented a special session during the second day in Reno. To pour as much information as possible into the conference, the presentation was divided into 6 periods consisting of 5-minute blitz sessions.

"Get heat anywhere"

Morton C. Smith, deputy manager of the HDR program and one of the first persons to conceptualize the approach, opened the lightning sessions with a history of the program. He said HDR development has centered on existing technology and has been based on accumulating information. Smith said the HDR idea was born from a need for alternative power plants, not dependent on conventional fuels, that could be established anywhere.

"We can't always go to the place where nature put the steam and hot water," Smith said. "We felt we could get heat anywhere there is hot rock."

Grant Heiken, manager of the resource analysis and site selection section of the HDR program, said that according to the United States Geological Survey, the earth contains 33 million quads of heat to a depth of 10 km under the area of the United States. He added, however, that it is not economically feasible to harness all of the heat contained under the surface of the United States.

"Our job for the next 5 years is to identify and determine the size of the HDR resource," Heiken said.

Jefferson Tester, of the Laboratory's Geothermal Technology (G-3) group, outlined technological developments. He said work to date has centered on proving technical feasibility, characterizing wellbores and performance, improving prediction models and mapping methods, and improving methods of HDR reservoir formation to extend the lifetime and capability of the fractured reservoir.

Prices elusive

A brief economic analysis of potential HDR electrical systems was given by Glenn Morris, of LASL's Energy Systems and Economic Analysis (S-2) Group. Citing information provided by the University of New Mexico and LASL, he said that electricity could be produced at bus bar prices ranging from 2.6 to 7 cents per kilowatt hour, assuming sound management, good resources, and favorable technical and financial conditions. Morris said it was difficult to pinpoint a price for electricity due to the variables involved and the program's infancy.

"This is less than 10 per cent of the annual funding for solar or fusion development. We think that is a damned good investment."

Jack Maddox, Public Service Company of New Mexico (PNM) project manager of the Baca hydrothermal site, outlined the needs a utility has in planning a new technology. For HDR to prove itself, he said, it must indicate that it is the most reasonable of the alternatives.

John McNamara, JM Energy Consultants, and a LASL consultant, addressed the legal and institutional issues of hot dry rock.

"It's not a very optimistic picture for those that want to see HDR developed," McNamara said. "There is a lack of definition of HDR in the 16 states that have geothermal laws; nothing in the other 34. The basic problem is there is no mention, anywhere, of resource ownership. A lawyer wouldn't be too charmed with the situation."

McNamara advised geothermal developers to push for statutory settlement of the situation rather than attacking the problem on a case by case basis in the courts.

"It is sometimes wiser to have legislators draft solutions," he said.

On the positive side, McNamara said that HDR appears to present few environmental impacts. He said HDR development would enjoy fluid control and high air quality.

"Damned good investment"

Gregory Nunz wrapped up the technical presentation by reminding his audience that HDR is now a program of national scope. It is charged with establishing the techniques of extracting heat from hot dry rock, and assessing the magnitude of the economically exploitable resource.

The Laboratory is now concerned with establishing the resource potential, he said, along with evaluating prospective sites; developing at least 2 demonstration sites; providing analytical and Laboratory support; developing instruments; and addressing the complex issues of environment, institutions, industry, and economics.

Nunz also said one of the test holes (GT-2) will be deepened for instrument testing in the geothermal environment. The cumulative total spent on HDR, a virtually inexhaustible resource, is about $34.5 million, he added.

"This is less than 10 per cent of the annual funding for solar or fusion development," Nunz said. "We think that is a damned good investment."

It's a gorgeous autumn in the Rockies. Bill Jack Rodgers sighted in on the distant Jemez range from a vantage point high in the Sangre de Cristo mountains while the aspens were turning burnt gold.

10, 15, 20 years ago

10 years ago

It got away

About a minute after a nuclear device was detonated underground at the Nevada Test Site, a 10-story-high tower began moving away from ground zero. When the ground collapsed into a crater, the tower was safe about 225 feet from its edge. Towers in the past have always been considered nearly expendable and none of this size have been retrieved before.

Vitreous carbon

Earl Fullman was making vitreous carbon at home in the evenings — until his wife complained about the mess and smell in the kitchen. All he needed was some of her eggs, cake mix, sugar, and a few other things normally found at home. Vitreous carbon, the residue left inside ovens after baking pastries, is also a good thermal insulator capable of withstanding temperatures in excess of 3,000 degrees C.

Test in Aleutians

More than 20 persons participated in the Milrow event, an underground nuclear calibration test on Amchitka Island in the Aleutians, Oct. 2. The Laboratory was responsible for providing the device, its placement, backfilling, and firing (with the help of EG&G).

Taken from the files of
the *LASL Community News*
and *The Atom.*

15 years ago

Envy of Ft. Knox?

A concrete tunnel is one of LASL's least-known but most unusual installations. It pierces deep into the north face of Los Alamos Canyon and has a floor area of 6,000 square feet. It was built to replace the D Site vault for storing nuclear material. The vaults are still used, and security is strict, but the long passageway and rooms are also ideal for physics experiments because of solid footing and excellent shielding.

Synchronized cells

Group H-4 has plunged into a major program of cellular and molecular biology. For the past year and a half, a corps of young Ph.D.s — microbiologists, virologists, and bacterial geneticists — have been recruited under alternate leader Don Ott. Cells are being grown in agitated suspension cultures, in volumes up to 18 liters.

Awanyu's gifts

A dozen prehistoric pottery jars and bowls have been found in recent months under the White Rock rim. Centuries ago, says legend, drought devastated the Pajarito Plateau because the god Awanyu was angry. The god may be angry again, say some; the pottery pieces were placed as ceremonial offerings to persuade him to lift the drought. Awanyu was the sacred plumed serpent.

20 years ago

Discontinued dormitories

Two men's dorms, operated by the Zia Co. on Iris Street, will be set aside for rental on a furnished basis through the Lodge. Rates will be $25 weekly or $90 monthly. Full-scale dorm operation has been a thing of the past for some time now; these units are being operated at a loss. The AEC-approved plan allows one dorm to be kept on standby basis for emergencies and for summer students.

Holding particles

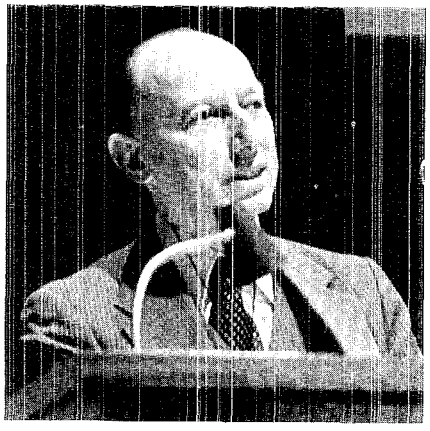
"Entropy trapping" is the latest approach to controlling thermonuclear power at Project Sherwood. It produced some encouraging results, using a version of the plasma acceleration gun developed by P-15's John Marshall, along with the "picket fence" magnet that hadn't been used since 1956. Data showed there was still some plasma in the field 200 microseconds after a shot.

Soviets tour

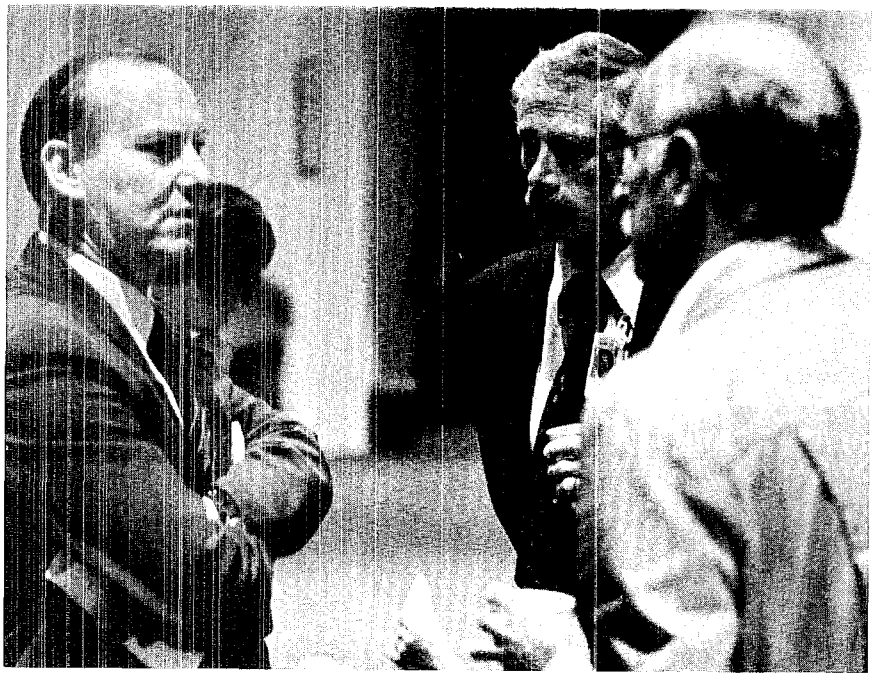
The first Soviet citizens to pass through Tech Area gates, 9 visiting scientists, were in Los Alamos Saturday. "Scientists can do a great deal to prevent another Ice Age," asserted Vasily S. Emelyanov. "I am an optimist and I believe the past will not repeat itself." Briefings on some of LASL's non-classified programs were part of a nation-wide tour.

☆ U.S. Government Printing Office: 1979 — 677—050/19

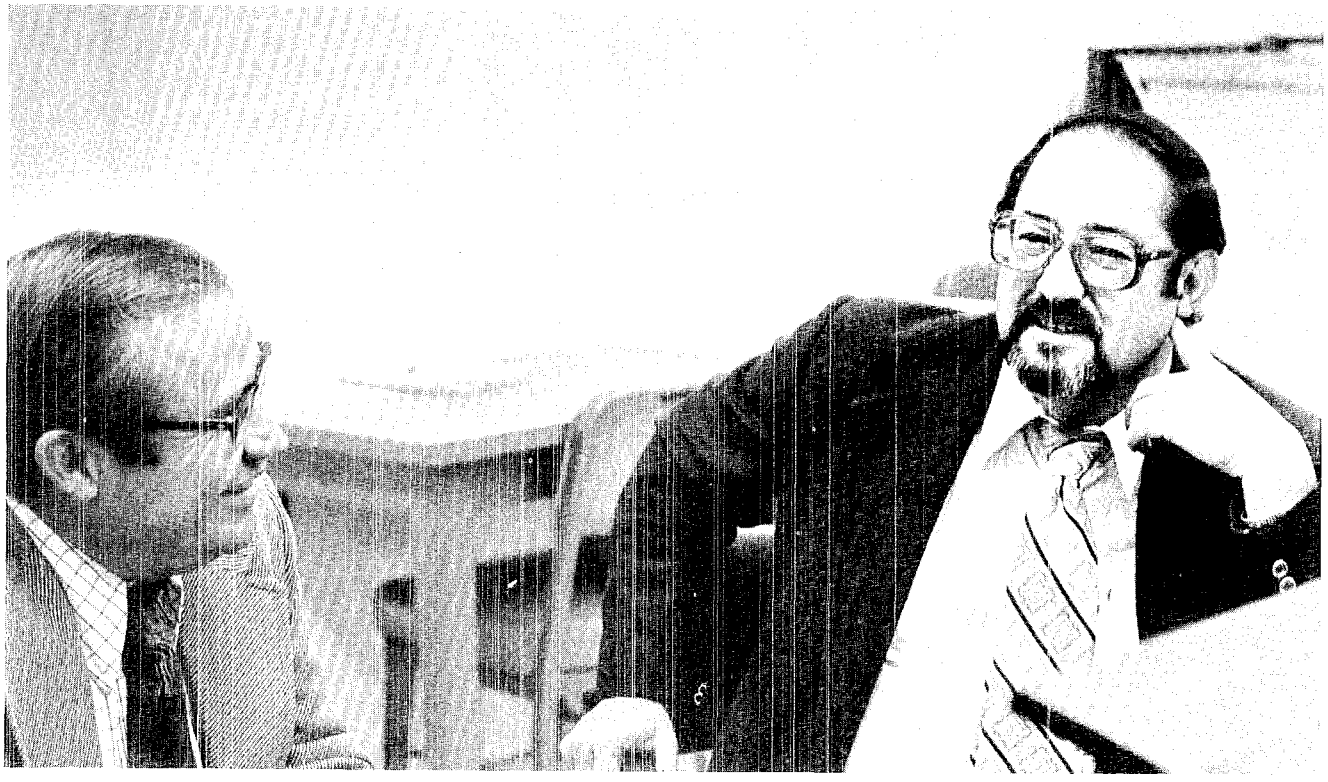
Among our visitors



Peter E. Glaser emphasized solar energy conversion to electrical power on Earth when he spoke here recently. Glaser is a vice president of Arthur D. Little, Inc.

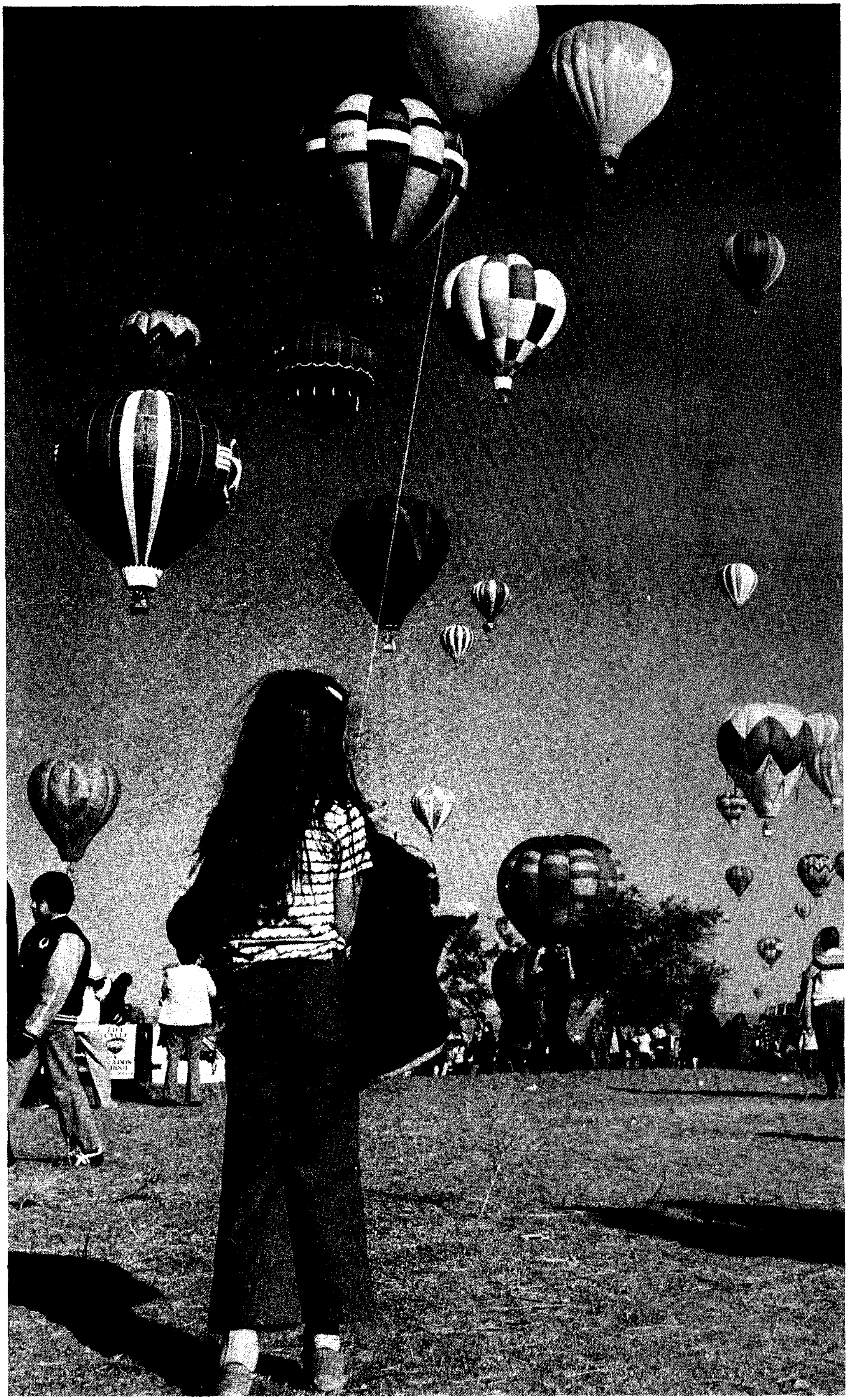


Bogdan Baranowski, left, a professor at the Institute of Physical Chemistry in Warsaw, Poland, gave a colloquium here on metal hydrogen systems in the high-pressure range.



John Aragon, right, president of New Mexico Highlands University, spoke at Los Alamos during National Hispanic Week. Here, he enjoyed a chat with Frank Guevara of Group H-1.

MOTZ HENRY THOMAS
3187 WOODLAND RD
LOS ALAMOS NM
87544



This young girl brought her own balloon to Albuquerque in October for the 1979 Balloon Fiesta, where about 400 participants went aloft during the several-day event. Bill Jack Rodgers couldn't resist this photo.